REMARKS/ARGUMENTS

Claims 1-3 and 5-30 are pending in the application. The Applicant hereby requests further examination and reconsideration of the application in view of the foregoing amendments and these remarks.

In paragraph 3, the Examiner rejected claims 1-3 and 8-28 under 35 U.S.C. § 103(a) as being unpatentable over Murray in view of De Couvreur. In paragraph 4, the Examiner rejected claims 5-7 and 29-30 under 35 U.S.C. § 103(a) as being unpatentable over Murray in view of De Couvreur, and further in view of Vaziri.

For the following reasons, the Applicant submits that all claims are allowable over the cited references.

Claims 1-3 and 5-30:

Claim 1 is directed to a device having a splitter adapted to receive an input signal corresponding to a duobinary sequence and generate a first copy and a second copy of the input signal. The device also has first and second comparators and a logic gate. The first and second comparators are adapted to receive the first and second copies, respectively, and generate first and second binary signals, and the logic gate is adapted to generate a third binary signal based on the first and second binary signals, wherein the third binary signal is a binary representation of the duobinary sequence.

On page 3 of the office action, the Examiner admitted that Murray does not teach "a splitter that splits the duobinary signal into a first copy and a second copy." However, the Examiner stated that:

> De Couvreur discloses in Figure 22 a method of converting a ternary signal (duobinary) to binary signal by splitting the [duo]binary signal into a first copy and a second copy. The converter of de Couvreur will detect and minimize errors in transmitting the signal. Therefore, any artisan having working knowledge in the art would have been motivated to have applied the technique of splitting the duobinary signal into a first copy and a second copy before being converted to binary as taught by de Couvreur in the system of Murray to provide an error free converter that is less susceptible to interference and other disturbances.

For the reasons stated below, the Applicant submits that the combination of Murray and De Couvreur does not teach the limitations of claim 1 and, as such, the rejection of that claim based on that combination is improper and should be withdrawn.

Murray discloses a circuit designed to convert a duobinary signal into a binary signal (see, e.g., Fig. 1 and page 1, lines 3-5). As already indicated above, the Examiner admitted that Murray does not teach a splitter. Instead, Murray relies on a simple branched wire to feed the input signal into comparators CP1 and CP2 (see, e.g., Murray's Fig. 1). The Applicant submits that, in the absence of a splitter, operation of the circuit at relatively high bit rates (e.g., greater than about 10 Gb/s) would be severely impaired. For example, at these bit rates, impedance mismatches in the feeds to comparators CP1 and CP2 would result in multiple signal reflections. These reflections would produce signal distortions that, for all practical purposes, would render further signal processing in the comparators substantially impossible.

De Couvreur discloses a demodulator capable of converting a balanced correlated ternary (BCT) code (a variant of duobinary modulation) back into a binary code (see, e.g., col. 10, lines 15-17). Various

possible demodulator circuits are shown in De Couvreur's Figs. 22, 24-31, and 33-39. Each demodulator circuit has two processing branches, one processing branch associated with threshold detector **TH1** and the other processing branch associated with threshold detector **TH2**. The processing branches converge at an output gate (e.g., gate **G23** in Fig. 22), which produces a binary output signal. Similar to Murray, De Couvreur relies on a simple branched wire to feed the input BCT signal into threshold detectors **TH1** and **TH2** (see De Couvreur's Figs. 22, 24-31, and 33-39). Since the Examiner already admitted that a simple branched wire of Murray is not a splitter analogous to that recited in claim 1, the Applicant does not understand how a similar simple branched wire of De Couvreur can possibly be that splitter. It is therefore submitted that De Couvreur does not teach or even suggest a splitter analogous to that recited in claim 1, the Examiner's statement to the contrary notwithstanding.

In contrast, a device of claim 1 has a splitter (e.g., wideband splitter **312** of Fig. 1), one purpose of which is to substantially avoid the above-indicated impedance-mismatch problems. When the frequency range (bandwidth) of a splitter is explicitly called out as, e.g., on page 5, lines 11-13, one skilled in the art understands that this specified frequency range is the range over which a matched impedance is provided. As a result, over that range, signal reflections are significantly reduced, thereby advantageously reducing signal distortions and enabling further signal processing in the comparators.

Vaziri teaches an optical waveguide splitter that is a part of a Mach-Zehnder (MZ) interferometer (see, e.g., Fig. 1 and col. 5, lines 10-15). The splitter of Vaziri is adapted to split, e.g., a continuous-wave (CW) optical carrier signal **14** generated by a laser **11** (Fig. 1 and col. 7, lines 6-9). Since carrier signal **14** is not modulated when it is applied to the optical waveguide splitter, the carrier signal does not correspond to any data sequence. As such, Vaziri does not teach or even suggest a splitter adapted to receive an input signal and generate a first copy and a second copy of the input signal, wherein the input signal corresponds to a duobinary sequence.

For all these reasons, the Applicant submits that claim 1 is allowable over the cited references. For similar reasons, the Applicant submits that claims 14, 18, and 21 are also allowable over the cited references. Since claims 2-3, 5-13, 15-17, 19-20, and 22-30 depend variously from claims 1, 14, 18, and 21, it is further submitted that those claims are also allowable over the cited references.

Claims 23-28:

Claim 23 specifies that each of the first and second threshold voltages is a selected constant voltage. Claims 25 and 27 include analogous recitations. For example, in a representative embodiment of converter **308** (Fig. 3) corresponding to claim 23, 25, or 27, each of voltages V1 and V2 applied to comparators **314a** and **314b**, respectively, is a constant voltage selected as described on page 5, lines 21-24.

Claim 24 specifies that each of the first and second threshold voltages is not based on peak detection in the input signal. Claims 26 and 28 include analogous recitations. For example, in a representative embodiment of converter **308** (Fig. 3) corresponding to claim 24, 26, or 28, each of voltages V1 and V2 applied to comparators **314a** and **314b**, respectively, is not based on peak detection in input signal *S(t)*.

On page 3 of the office action, in the paragraph presumably directed to claims 23-28, the Examiner stated that:

> It is to be noted both comparators of Murray receive the same analog signal having the same amplitude. Like any converter/encoder, the duobinary to binary data converter is an electrical

device that can be used in any communication device. Moreover, the threshold voltage can be set on predetermined criteria. In other words, the threshold voltage can be programmed or pre-programmed or set based on peak detection of the input signal or not on the peak detection of the input signal, or it can be fixed or variable based on the type of converter and its operation.

In response, the Applicant submits that Murray explicitly teaches that threshold (reference) voltages X and Y applied to comparators CP1 and CP2 (Murray's Fig. 1) are generated using a rectifier circuit. More specifically, voltages X and Y are derived from the rectified peak (highest and lowest) levels in the input signal (see, e.g., page 3, line 19, through page 4, line 2). As such, both threshold voltages X and Y vary with variations in the input signal and, therefore, Murray explicitly teaches that the threshold voltages are not constant voltages. By the same token, Murray explicitly teaches that the threshold voltages are generated based on peak detection in the input signal. For one or more of the following reasons, it may be advantageous to have a selected constant threshold voltage rather than a threshold voltage derived via peak detection in the input signal as taught by Murray.

For a modern high-speed transmission system having a relatively large number of high-speed links (i.e. a high-speed backplane system), inter-link crosstalk is an important issue. For example, due to the crosstalk, energy from one trace may be coupled into a different trace, e.g., through radio-frequency (RF) emission. This coupling may cause the signal peak levels in each link to change in an unpredictable manner depending on the signals in the other links. In the circuit of Murray, these peak variations would result in threshold-voltage variations that would likely induce decoding errors. Having a constant threshold voltage advantageously reduces this problem.

Furthermore, at relatively high bit rates (e.g., greater than about 40 Gb/s), the design and implementation of a rectifier (peak detector) circuit of Murray becomes relatively difficult. More specifically, at these bit rates, parasitic RF couplings within the rectifier circuit may cause threshold-voltage changes even when the peak-to-peak amplitude swing in the input signal remains relatively steady. These changes would cause additional decoding errors. Having a constant threshold voltage provides a way of generating threshold voltages without the use of rectifier circuits, thereby reducing the number of decoding errors.

The Applicant submits that Murray did not even recognize the above-outlined problems associated with the use of his rectifier circuit. Neither did Murray provide or even suggest any alternatives to the method of generating threshold voltages embodied in his rectifier circuit. Without a suggestion in the prior art for a necessary modification and/or combination, a rejection on the grounds of obviousness is an improper use of hindsight. See, e.g., In re Fritch, 972, F.2d 1260, 1266, 23 USPQ2d 1780, 1784 (Fed. Cir. 1992) ("[I]t is impermissible to use the claimed invention as an instruction manual or 'template' to piece together the teachings of the prior art so that the claimed invention is rendered obvious . . . This court has previously stated that '[o]ne cannot use hindsight reconstruction to pick and choose among isolated disclosures in the prior art to deprecate the claimed invention.'"); Texas Instruments Inc. v. U.S. Int'l Trade Comm'n, 988 F.2d 1165, 1178, 26 USPQ2d 1018, 1029 (Fed. Cir. 1993) ("Absent . . . [a] suggestion to combine the references, respondents can do no more than piece the invention together using the patented invention as a template. Such hindsight reasoning is impermissible."); In re Gorman, 933 F.2d 982, 987, 18 USPQ2d 1885, 1888 (Fed. Cir. 1991) ("As in all determinations under 35 U.S.C. section 103, the decisionmaker must bring judgment to bear. It is impermissible, however, simply to engage in a hindsight reconstruction of the claimed invention, using the applicant's structure as a template and selecting elements from references to fill the gaps."); Symbol Technologies Inc. v. Opticon Inc., 17 USPQ2d 1737, 1746 (S.D.N.Y. 1990), aff'd, 935 F.2d 1569, 19 USPQ2d 1241 (Fed. Cir. 1991) ("That a technician, in hindsight, could combine elements known within the technology to produce the contested patent does not make the patent obvious to one skilled in the art

at the time the patent was issued."); In re Dow Chemical Co., 837 F.2d 469, 473, 5 USPQ2d 1529, 1531 (Fed. Cir. 1988) ("The consistent criterion for determination of obviousness is whether the prior art would have suggested to one of ordinary skill in the art that this process should be carried out and would have a reasonable likelihood of success, viewed in light of the prior art . . . Both the suggestion and the expectation of success must be founded in the prior art, not in the applicant's disclosure."); In re Stencel, 828 F.2d 751, 755, 4 USPQ2d 1071, 1073 (Fed. Cir. 1987) (obviousness cannot be established "by combining the teaching of the prior art to produce the claimed invention, absent some teaching or suggestion that the combination be made.").

In view of the foregoing, the Applicant submits that the teachings of Murray were used improperly in the rejections of claims 23-28 and, as such, these rejections should be withdrawn. This fact provides additional reasons for the allowability of claims 23-28 over the cited references. The Applicant submits therefore that the rejections of claims under §103(a) have been overcome.

In view of the above amendments and remarks, the Applicant believes that the now pending claims are in condition for allowance. Therefore, the Applicant believes that the entire application is now in condition for allowance, and early and favorable action is respectfully solicited.

Respectfully submitted,

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